

**Concord**  
PUBLIC SCHOOLS

**Concord-Carlisle**  
REGIONAL SCHOOL DISTRICT

# VENTILATION SYSTEM READINESS

by  
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## DISCLAIMER

This report is intended to offer guidance regarding best practices regarding the general operations of the Heating Ventilation and Airconditioning Systems (HVAC) to reduce the risk of disease transmission, specifically novel coronavirus SARS-CoV-2 and the disease it causes, COVID-19.

This document is based on best available evidence and knowledge, but in many aspects' corona virus (SARS-CoV-2) information is so limited or not existing that previous SARS-CoV-1 evidence<sup>1</sup> has been utilized for best practice recommendations.

The report is in no way intended to override or supersede guidance from government and health organizations, including, without limitation, the Centers for Disease Control and Prevention, the World Health Organization, the United States Government, and or the State of Massachusetts.

I do not warrant the accuracy or completeness of the guidance in this report and assume no responsibility for any injury or damage to persons or property arising out of or related to any use of the report or for any errors or omissions.

# HOW THE VIRUS SPREADS

- Person to Person
- Contact surfaces
- Shortrange airborne transmission\*

\* CDC and WHO have not yet accepted that short range airborne transmission is possible. However in order to reduce the risk, we should do everything possible to mitigate it.

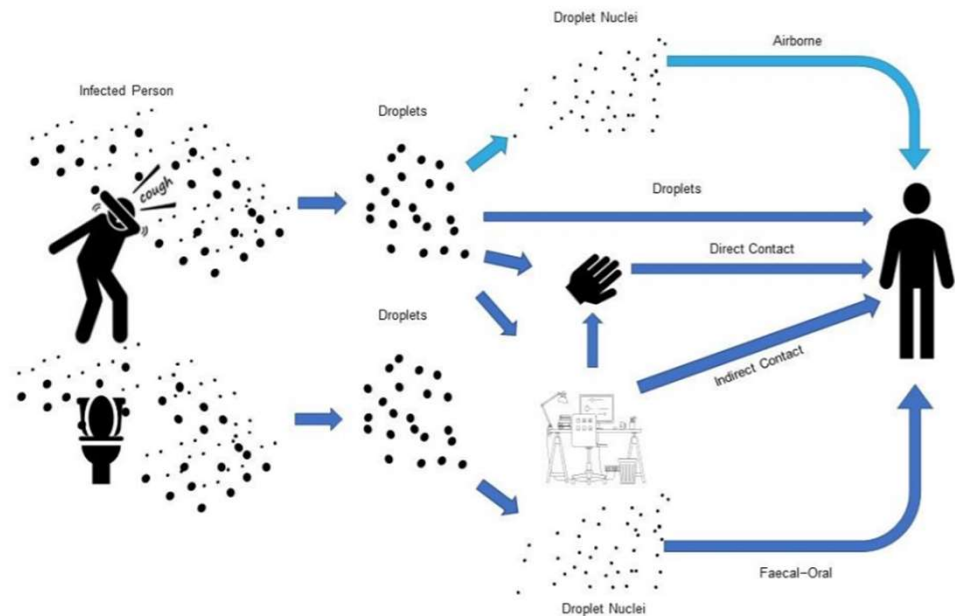


Figure 1. WHO reported exposure mechanisms of COVID-19 SARS-CoV-2 droplets (dark blue colour). Light blue colour: airborne mechanism that is known from SARS-CoV-1 and other flu, currently there is no reported evidence specifically for SARS-CoV-2 (figure: courtesy Francesco Franchimon).

Indoor crowded spaces with poor ventilation (<5 cfm per person) can cause short range airborne transmission

# ASHRAE POSITION STATEMENT

- Transmission of SARS-CoV-2 through the air is sufficiently likely ..... Changes to the building operations, including operation of HVAC systems, can reduce airborne exposures
- **Ventilation** and **filtration** provided by HVAC systems **can reduce** the airborne concentration of SARS-CoV-2 and the risk of transmission through the air.



## CDC GUIDELINES ON VENTILATION

- **Ventilation**
  - Ensure ventilation systems operate properly and increase circulation of outdoor air as much as possible, for example by opening windows and doors. Do not open windows and doors if doing so poses a safety or health risk (e.g., risk of falling, triggering asthma symptoms) to children using the facility.

# LAYERED STRATEGIES TO MITIGATE

- Wear a mask
- Practice safe distancing
- Wash your hands
- Cleaning and disinfecting
- Increase ventilation rate per person - Dilution
- Enhance air filtration where possible
- Use HEPA Air filter air purifiers when ventilation is not possible



## OTHER MITIGATION STRATEGIES NOT CONSIDERED

- Ultraviolet Germicidal Irradiation (UVGI)
- Ionization

## SCHOOLS REVIEWED

- Concord Middle Schools – Peabody and Sanborn
- Willard Elementary School
- Thoreau Elementary School
- Concord Carlisle Regional School District
- Alcott Elementary School
- Ripley – Integrated Preschool

All school ventilation systems for specific spaces were visually inspected during the week of August 3<sup>rd</sup>, 2020.

Typical spaces that were looked at:

1. Classrooms
2. Library
3. Nurses room and Medical waiting room
4. Gymnasiums
5. Cafeteria



## CONCORD MIDDLE SCHOOL - SANBORN

- Middle School – Grade 7 and 8
- Most classrooms have unit ventilators (UVs) with exhaust in the room
- Exhaust fans is functional
- Pneumatic controls are functional at most locations
- Some classrooms have window ACs with operable windows and UVs
- Each classroom is capable of delivering 350 CFM of outside air ( if outside air damper is functioning properly)
  - At 20 CFM per person that would provide ventilation for 18 people
- Smaller classrooms have 225 CFM of outside air ( if damper is open)
  - At 20 cfm per person that would provide enhanced ventilation for 11 people

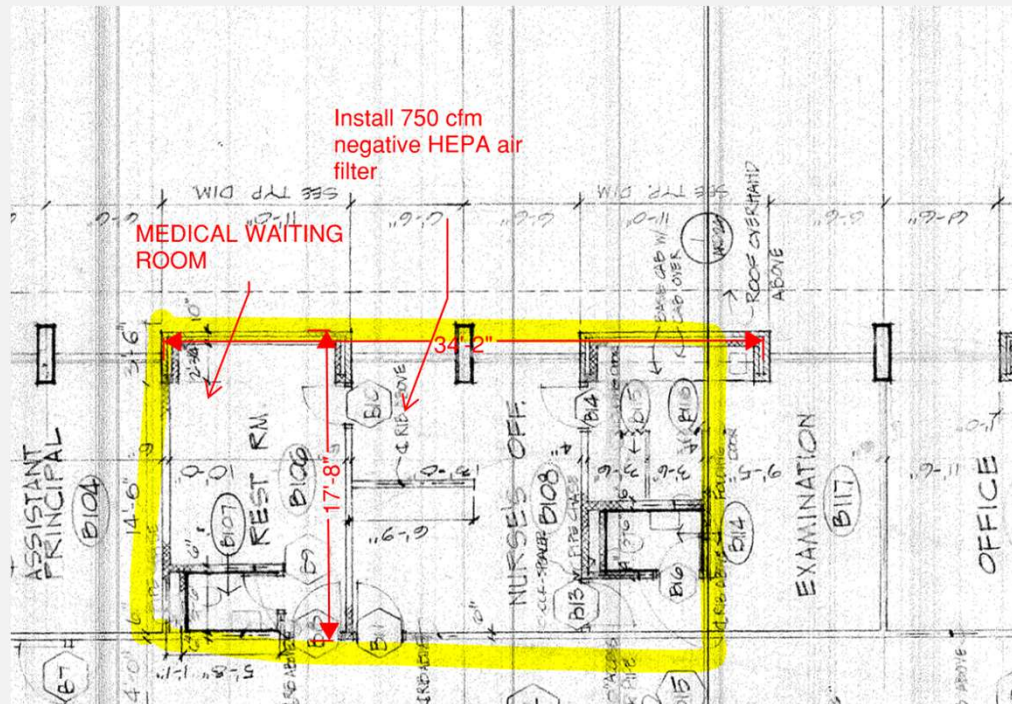
## CONCORD MIDDLE SCHOOL - SANBORN

- Larger areas like Auditorium, cafeteria and gyms have air handling units with return air and outside air damper
  - Functionality of these outside air dampers are unknown – since they are pneumatically operated. Could not visually see the operation
  - Some units are difficult to access and check operation
- Modular classrooms have wall mounted units – 25% outside air – minimum. % of outside air exceeds minimum requirements.
- All windows are operable
- The only source of ventilation to admin areas are the operable windows.

## CONCORD MIDDLE SCHOOL – SANBORN - RECOMMENDATIONS

- Unit Ventilators
  - Clean, vacuum the unit
  - Change the filter
  - Blow air from inside to outside to clean coil and outside air louver
  - Test OA damper for each unit – by
    - Calling for heat – OA damper should open up at least 2” (Can be checked closer to winter)
    - Calling for cooling – OA damper open maximum
  - We tested several units and the pneumatics work, but on call for heat OA damper closes 100%.
- Check exhaust fans are functional – classrooms, toilets etc.
- Modular units – check that damper is open
- Auditorium, and gymnasium – hire a mechanical contractor to check dampers, motors etc. After functionality is verified, then safe to occupy
- Cafeteria – Open windows, run the kitchen hood exhaust fan 24 x 7 and install HEPA filter air purifier – 1700 cfm – Max 85 kids
- If kitchen is used – run exhaust fan 24 x 7 and open windows
- Purchase a portable CO2 monitor to check CO2 levels in classrooms weekly when occupied

## CONCORD MIDDLE SCHOOL – SANBORN NURSES ROOM



- Install 750 cfm HEPA exhaust machine
- Duct exhaust to outdoors
- Ensure that exhaust duct is 10 feet away from any intakes or people



## CONCORD MIDDLE SCHOOL - PEABODY

- Middle School – Grade 6
- Most classrooms have unit ventilators (UV) with exhausters (wall mounted)
- Pneumatic controls – Not sure of condition of controls.
- OA dampers configuration is different from Sanborn
- Some rooms have window ACs with operable windows
- Each classroom is capable of delivering approximately 300 CFM of outside air (if damper is functioning properly)
  - At 20 CFM per person that would provide ventilation for 15 people

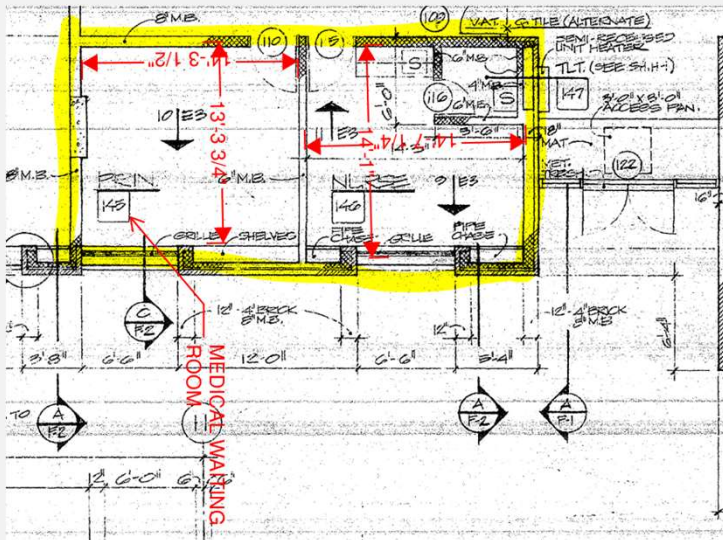
## CONCORD MIDDLE SCHOOL - PEABODY

- Larger areas like cafeteria, kitchen and gyms have heating and ventilating units with return air and outside air damper
  - These are indoor spaces with no windows
  - Functionality of these outside air dampers are unknown – since they are pneumatically operated
  - Some units are difficult to access and check operation
- Room 201 – has windows and no UV
- Library H&V unit is not accessible. Windows are open and provide ventilation
- Room 203 – no unit ventilator – only exhaust and windows
- Computer Lab – no ventilation and no windows – only has recirculating mini split unit
- Gymnasium exhaust units not operational – condition of outside air damper is not known

## CONCORD MIDDLE SCHOOL – PEABODY - RECOMMENDATIONS

- Unit Ventilators
  - Clean, vacuum the unit
  - Change the filter
  - Blow air from inside to outside to clean coil and outside air louver
  - Test OA damper for each unit – by
    - Calling for heat – OA damper should open up atleast 2” – Can be checked in winter
    - Calling for cooling – OA damper open maximum
  - Check exhaust fans are functional – classrooms, toilets etc.
- Cafeteria, library, computer lab, indoor spaces with no windows and mechanical ventilation– if used – should have HEPA Air filter purifiers.
- All classrooms – install 300 CFM HEPA air filter purifier. Operate UVs and also open up windows when possible
- Since the gymnasium is a larger space – HEPA Air purifiers may not be effective. Do not recommend using space until the unit is checked for proper operation
- Individual offices – open up window when possible
- Purchase a portable CO2 monitor to check CO2 levels weekly

## CONCORD MIDDLE SCHOOL – PEABODY NURSES ROOM



- Room 101 B is Medical waiting room
- Install HEPA air purifier in Nurses room – 300 cfm
- Install window exhaust fan – 300 CFM in 101 B with a HEPA purifier 300 CFM inside the room.
- Put a sign outside for people to stay 10 feet away from duct or fan



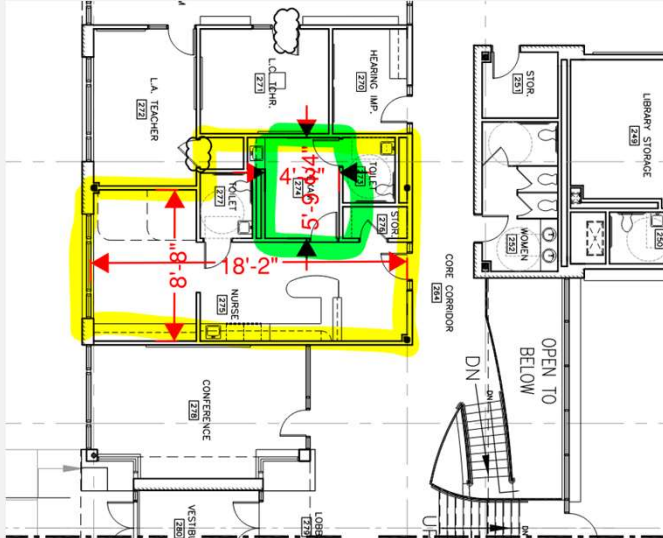
# WILLARD ELEMENTARY SCHOOL

- Elementary school
- Newer design and highly efficient HVAC systems
- 100% outside air to classrooms with energy recovery units ( ERU)- 100% outside air
- Advanced CO2 monitoring system ( Aircuity) – ensures that all classrooms have the right amount of ventilation
- Automated controls
- Bigger spaces have ERUs and sufficient outside air
- Classroom Windows are interlocked with VAV – **DO NOT OPEN WINDOWS**
- Classroom,Auditorium Cafeteria units have pre filter and MERV 13 filter
- Gymnasium unit – based on minimum outside air – maximum 100 people

## WILLARD ELEMENTARY SCHOOL - RECOMMENDATIONS

- Ensure that Aircuity demand control ventilation system is functional
  - During my visit certain room sensors were shown as unreliable
  - This system was recently serviced.
  - Keep set point at 900 ppm
- Check calibration of all RA CO2 sensors
- **DO NOT OPEN WINDOWS IN CLASSROOMS**

# WILLARD ELEMENTARY SCHOOL NURSES ROOM



LOCATION NOT YET DECIDED

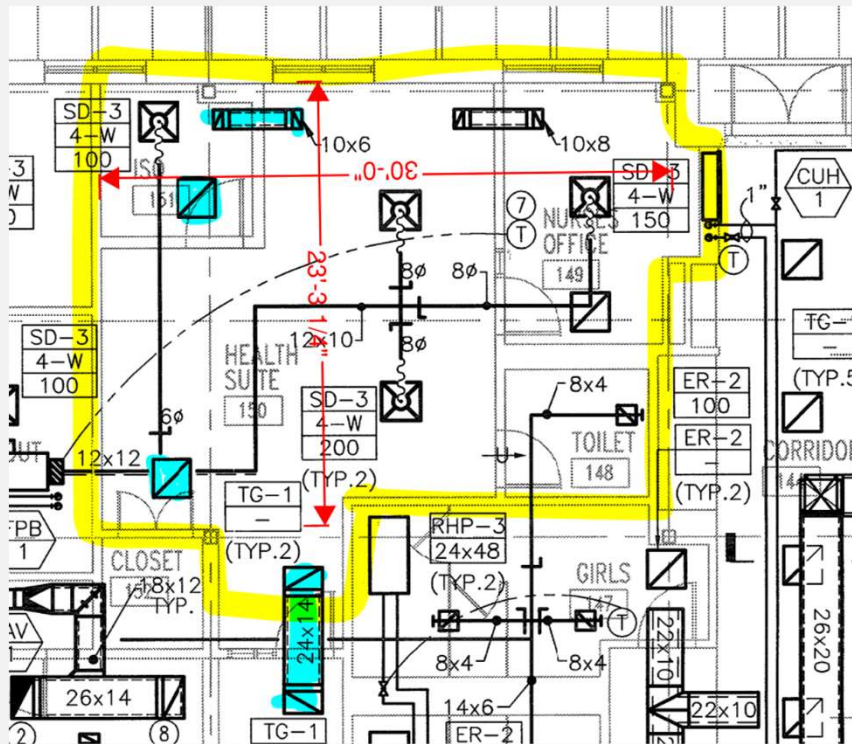
# THOREAU ELEMENTARY SCHOOL

- Elementary school
- 2006 wing – 100% OA with Energy recovery unit (ERU) for classrooms
  - Cooling added to ERUs
  - Auditorium , gymnasium and cafeteria has ERU with direct expansion (DX) cooling and heating
  - Library AHU has return air (RA CO<sub>2</sub>) sensor with cooling and heating. At 20 cfm per person, minimum OA is capable of having 35 people at any time, but RA CO<sub>2</sub> sensor will increase the amount of outside air, if more people are present.
- 1994 wing has 2 AHUs with recirculated air and outside air
  - Constant volume units
  - 6,000 cfm of total air flow
  - Assuming min OA is 20%, i.e 1,200 cfm or suitable for 60 people
  - 8 classrooms at 20 people per classroom – 160 people.
- Music room has separate units – minimum OA capable of 30 people.

## THOREAU ELEMENTARY SCHOOL- RECOMMENDATIONS

- Check calibration off RA CO2 sensors
- Change filters.
- Ensure that minimum damper position of the 1994 wing AHUs is atleast 50%.  
Need to be careful during winter conditions.

# THOREAU ELEMENTARY SCHOOL NURSES ROOM



- Medical waiting room not yet decided
- Install HEPA Air purifier in Health Suite – 750 CFM
- If medical waiting room is in the Health Suite – Install 100 CFM negative air machine
- RA ducts and transfer grilles highlighted in blue must be sealed and closed to prevent transfer of air to other spaces – IF THE MEDICAL WAITING ROOM IS IN THE SAME AREA.

# CONCORD CARLISLE REGIONAL

- Regional high school
- 440,000 sq.ft
- 1,300 students
- Hybrid Model – 16 to 18 per class
- All classrooms have energy recovery units (ERUs) with 100% outside air and a mixing damper to recirculate air.
  - Outside air (OA) is 70% and RA is 30%. Each system has 14,000 cfm of OA or provide safe ventilation for 700 people..There are 2 units.These units can provide ventilation for 1,400 people at enhanced ventilation rates
  - All classrooms have CO2 room sensors that modulate the amount of ventilation air in the room.
- All HVAC systems are newer and visually in good condition
- Gymnasium, Cafeteria, Auditorium have good systems with sufficient outside air and controls to provide more if needed
- Automated controls
- Teachers Room ( for e.g. Room 317 – Interior space. Should maintain 50% capacity in these rooms
- Teachers lunch room – Room 328 – Should maintain 50% capacity

## CONCORD CARLISLE REGIONAL

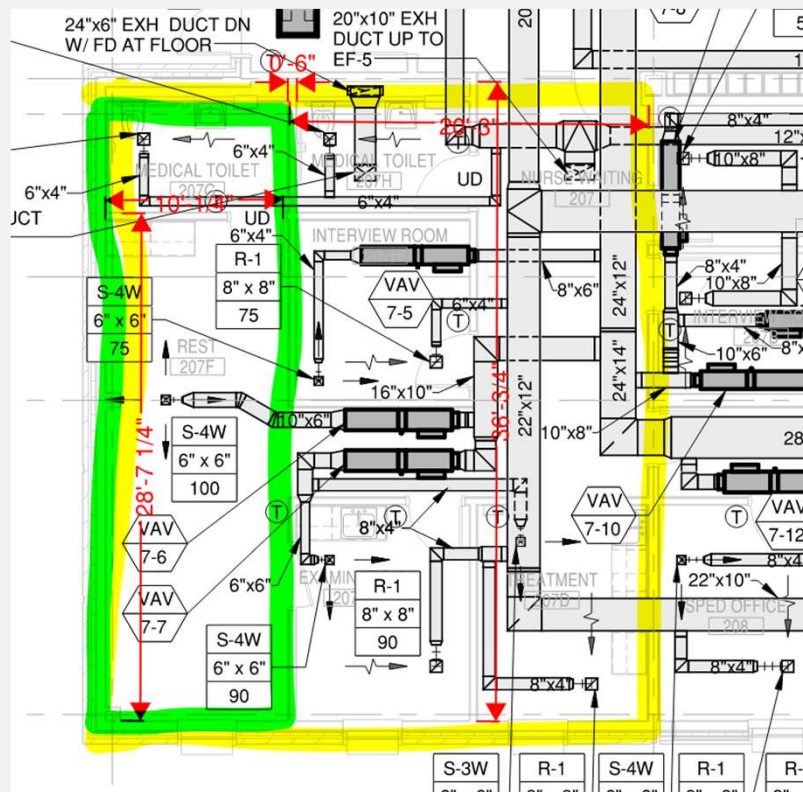
- Cafeteria unit has 70% outside air with RA CO<sub>2</sub> sensor. Minimum outside air can safely provide ventilation to 225 kids.
- Admin/SPED unit has 50% outside air. At minimum air can safely provide enhanced ventilation for 120 people. These units have RA CO<sub>2</sub> sensors and should increase the minimum outside air if needed.



## CONCERNORD CARLISLE REGIONAL RECOMMENDATIONS

- Set CO2 set points to 900 ppm
- Check Heat Wheel for cleanliness
- Change filters to manufacturers recommendations
- Calibrate CO2 sensors.
- Post signs in Teachers rooms and lunchrooms on 50% occupancy requirements

# CONCORD CARLISLE REGIONAL NURSES ROOM



# RIPLEY INTEGRATED PRE SCHOOL

- Pre School and Admin office
- Pre School and Day Care have older systems
- Each Pod has 2 classrooms with 1 Heating and Ventilating unit that serves both classrooms.
- Units are operational.
- Supply air is near windows. **Do not block supply air grilles**
- Return air grilles are blocked – **This should be cleared.**
- Each AHU is about 2,000 CFM. Has an exhaust fan on the roof with 1,000 cfm. So indoor spaces generally should have about 50% OA which is good
- Speech and PT room – there is no mechanical ventilation
- Parents and Children program – there is no mechanical ventilation
- STEAM – Has ERUs with mini splits.
- Launch Room – UV is really old and there is no other source of mechanical ventilation
- Conference rooms have ERUs and a CO2 sensor. Most of the air is ventilated air.



Clear area for  
proper air flow

## RIPLEY INTEGRATED PRE SCHOOL

- Admin offices are not heavily populated – Like Office space
- There is no mechanical ventilation – Recommend that windows are open if number of people in any room exceed 2
- Have meetings in Conference rooms that have good ventilation
- HR office – has no mechanical ventilation. Recommend that everyone wear masks and have physical barriers, if there is over the counter transactions or discussions. Open windows in this room where possible

## RIPLEY INTEGRATED PRE SCHOOL - RECOMMENDATIONS

- Speech PT room, Parents and children program and Launch room should have HEPA filter air purifier – 350 cfm each.
- Install HEPA air filter purifier – 300 cfm in each of the classroom pods. Check that exhaust fan is running. Change filters
- Locate air purifier in the middle of classroom near the wall
- ERU for conference room – Change filters and clean the ERU Core with air pressure
- Check that the H&V units for the classroom pods- OA damper is open and exhaust fans are operational – This is for the classrooms.

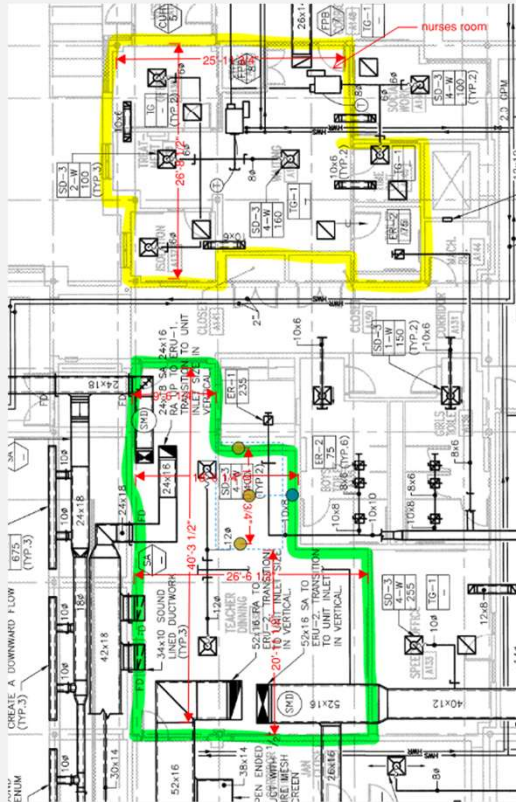
## ALCOTT ELEMENTARY SCHOOL

- Elementary school
- Newer design and highly efficient HVAC systems
- 100% outside air to classrooms with energy recovery units ( ERU)
- Automated controls
- Bigger spaces have ERUs and sufficient outside air
- Gym, Café and Auditorium have ERUs with 100% outside air
- Admin, Stage and Library also have good ventilation, but with recirculated air –

## ALCOTT ELEMENTARY SCHOOL

- Change filters to MERV 13 where possible
- Clean ERUs with compressed air
- Adjust schedules to meet general recommendations

# ALCOTT ELEMENTARY NURSES ROOM























Nurses Room – Install HEPA Air filter purifier – 600 cfm

Medical waiting room – Seal return air and Install HEPA Exhaust – 750 cfm

Challenge is there is no way to exhaust – as the room is not next to a window – Relook at the space



# VENTILATION SYSTEM READINESS

		Hybrid Model	
	Ventilation Systems	Natural Ventilation w/ HEPA air purifier	Mechanical + Natural Ventilation
Peabody			
Sanborn			
Willard			
CCHS			
Thoreau			
Ripley IPS			
Alcott			
	Older systems		
	Mix of natural and mechanical ventilation		
	Systems capable of delivery of proper ventilation		
	Mix of natural ventilation w/HEPA Airfilter Purifiers		

## GENERAL RECOMMENDATIONS – FOLLOW FOR ALL BUILDINGS WHERE APPLICABLE

- Increase ventilation rate per person (dilution)
- ASHRAE 62.1-2019 minimum is 12 to 15 cfm per person for classrooms
  - At Concord Public Schools– we are trying to deliver 20 cfm per person (under reduced capacity)
- Upgrade filters where possible. Follow manufacturer recommendations on replacement
- Change demand control ventilation set points to 900 ppm – where applicable
- Open windows where mechanical ventilation is not possible, except at Willard
- Add HEPA air filter purifiers in locations where natural or mechanical ventilation is not possible OR indoor spaces with no mechanical ventilation
- Keep toilet exhaust fans running 24/7
- DO NOT operate Hand Dryers
- DO NOT add standing fans or industrial fans to classrooms. Avoid turbulent airflows across students
- OPERATE HVAC systems 1 week in “NORMAL OCCUPANCY MODE” before school starts
- Start units 1 hour before any occupancy. The units should be in occupied mode with full ventilation
- Turn units off 2 hours after building is unoccupied and this includes cleaning
- Flush all building water systems

## MEDICAL WAITING ROOMS

The medical waiting room is designated for students who the nurses suspect to have COVID-19 symptoms and are asked to wait in this room until the student's parents or guardians pick the student up. The student(s) will always be wearing their masks on. There is no plan for testing in this room.

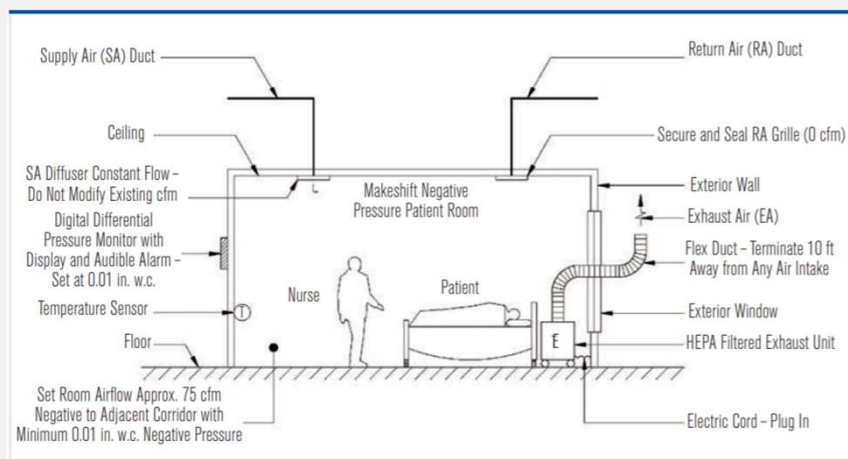
It is important to have negative pressure at these locations, i.e air from adjacent spaces flows into the room.

1. Be proactive and not reactive
2. Place noisy, portable HEPA exhaust fan units outside whenever possible
3. Pressure inside the medical waiting room should be negative relative to adjacent rooms
4. Do not penetrate fire walls for temporary ducts
5. Do not use existing return air duct system for exhaust
6. Locate the HEPA exhaust units to ensure all exhaust ductwork outside the room is under negative pressure
7. Keep exhaust at least 10 feet away from any populated area, any outside air intake that could return the exhaust air back into the building

# MEDICAL WAITING ROOM – EXAMPLE PHOTOS



PHOTO 1 Place noisy, portable HEPA exhaust fan units outside, whenever possible (Lesson 2).



# HEPA AIR PURIFIERS

[https://www.amazon.com/gp/product/B07DD9H6YH/ref=ox\\_sc\\_act\\_title\\_1?smid=ATVPDKIKX0DER&psc=1](https://www.amazon.com/gp/product/B07DD9H6YH/ref=ox_sc_act_title_1?smid=ATVPDKIKX0DER&psc=1)



300 cfm of clean air delivery. Can use combination of these in several rooms - \$220

Install these inside classrooms, library etc.


The units should be installed in the MIDDLE of the classroom or any room near a wall on the opposite side of a window

# HEPA EXHAUST FILTERS

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**HEPA-AIRE® PAS750 Portable Air Scrubber**

- Variable-speed airflow, with maximum rated airflow as high as 750 cfm
- The anodized aluminum cabinet is lightweight and resistant to corrosion and scratching
- Up to five PAS750 units can be safely daisy-chained on one 15-amp circuit
- Easy-opening swing-out hinged door with a secure cam latch and a gasket to protect against filter by-pass

[Download Product Info](#)

Abatement Technologies - \$900

<https://www.abatement.com/hepa-airr-portable-air-scrubber-750.html>

Nurses and Medical waiting room

Concord Public Schools			
	Model	Qty	Notes
<b>Sanborn</b>			
nurses	PAS 750	1	
dining	PAS 750	2	
Spare	Honeywell	5	
<b>Peabody</b>			
Classroom	Honeywell	27	
Dining	PAS 750	2	
MWR	Honeywell	1	with window exhaust fan
Nurses	Honeywell	1	
<b>Thoreau</b>			
Heath Suite	Honeywell	2	
Isolation	Honeywell	1	with window exhaust fan
Spare	Honeywell	4	
<b>CCHS</b>			
MWR	Honeywell	2	with window exhaust fan
Nurses	Honeywell	2	
<b>Alcott</b>			
Nurses	Honeywell	2	
MWR			
	PAS 750	2	
<b>Willard</b>			
Nurses	Honeywell	1	
Isolation	PAS 750	1	Do not know the exact room
<b>Ripley</b>			
3 Pods ( A,B,C)	Honeywell	6	
Launch	Honeywell	2	
Parents	Honeywell	1	
HR	Honeywell	1	

Location and qty of HEPA filter purifiers

## EQUIPMENT MAINTENANCE

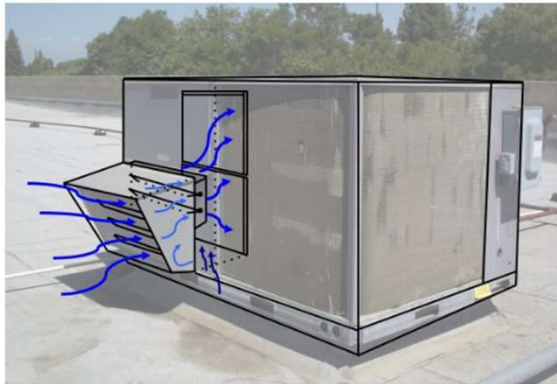
- Follow manufacturer recommended maintenance cycles for all HVAC equipment
- Change air filters for UVs every 3 months instead of 6 months
- During filter change outs check proper operation of outside air damper
- Check CO2 levels on a weekly basis with a portable CO2 monitor – especially suspect areas
- For Peabody and Sanborn – make random checks of the UV dampers



## FAQ AND HOW SYSTEMS WORK

# BUILDING VENTILATION

Ventilation is the process of bringing outdoor air inside a building to dilute indoor contaminants



Mechanical Ventilation: Rooftop Unit

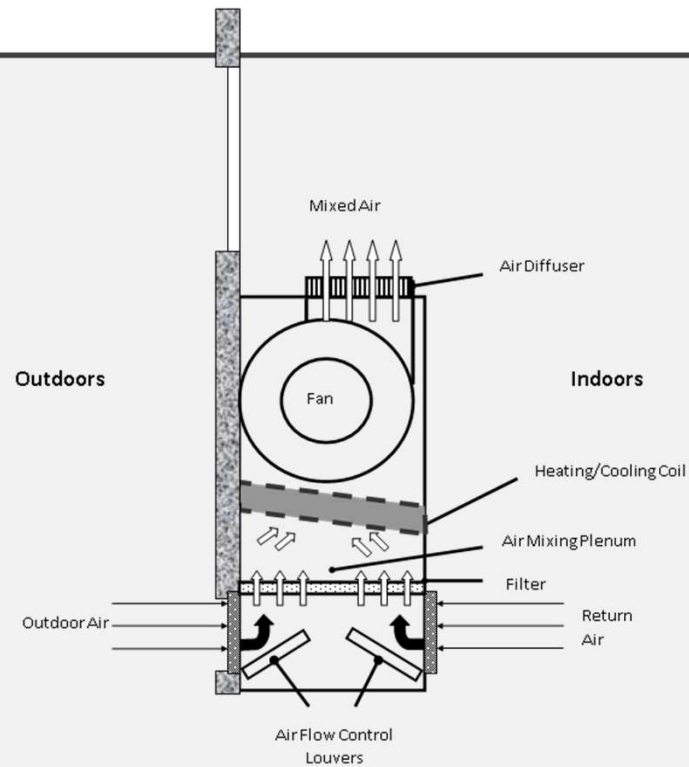


Wall-Mount System



Natural Ventilation: Windows, Doors

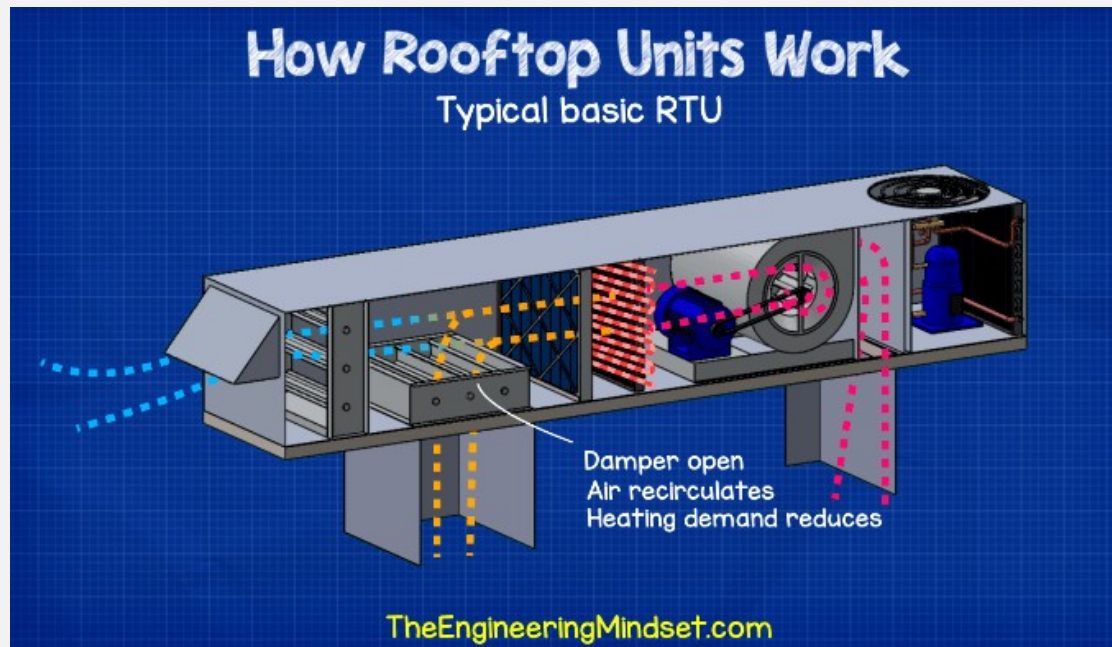
# UNIT VENTILATIONS



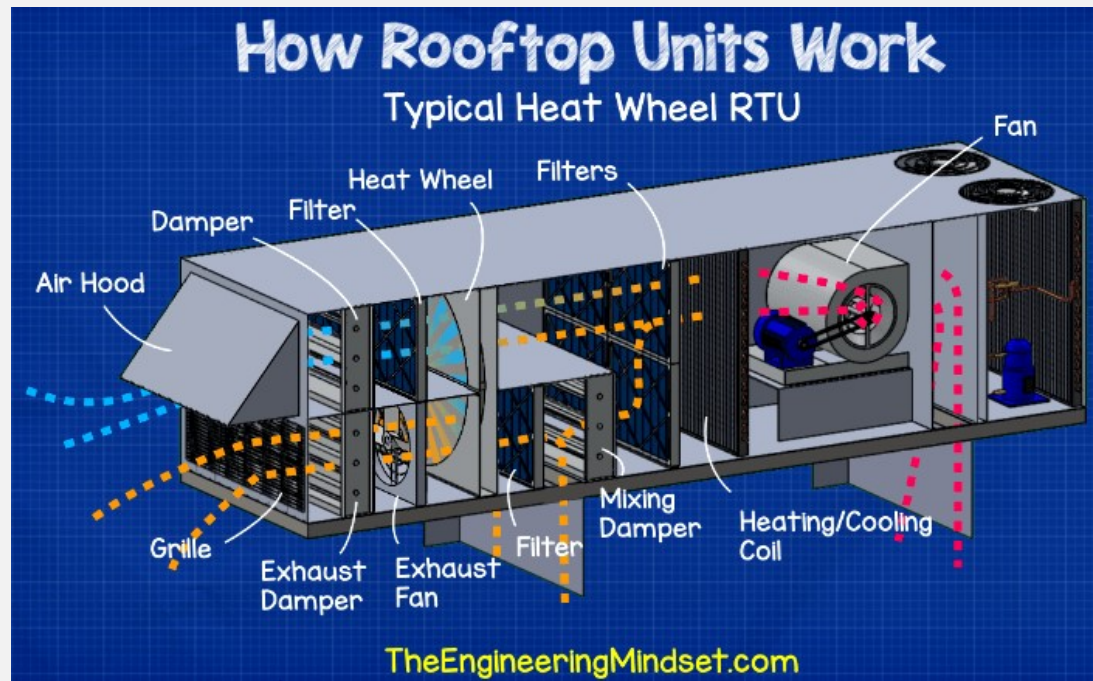
## Air Flow

- ← = Fresh air return
- ⇐ = Mixed air

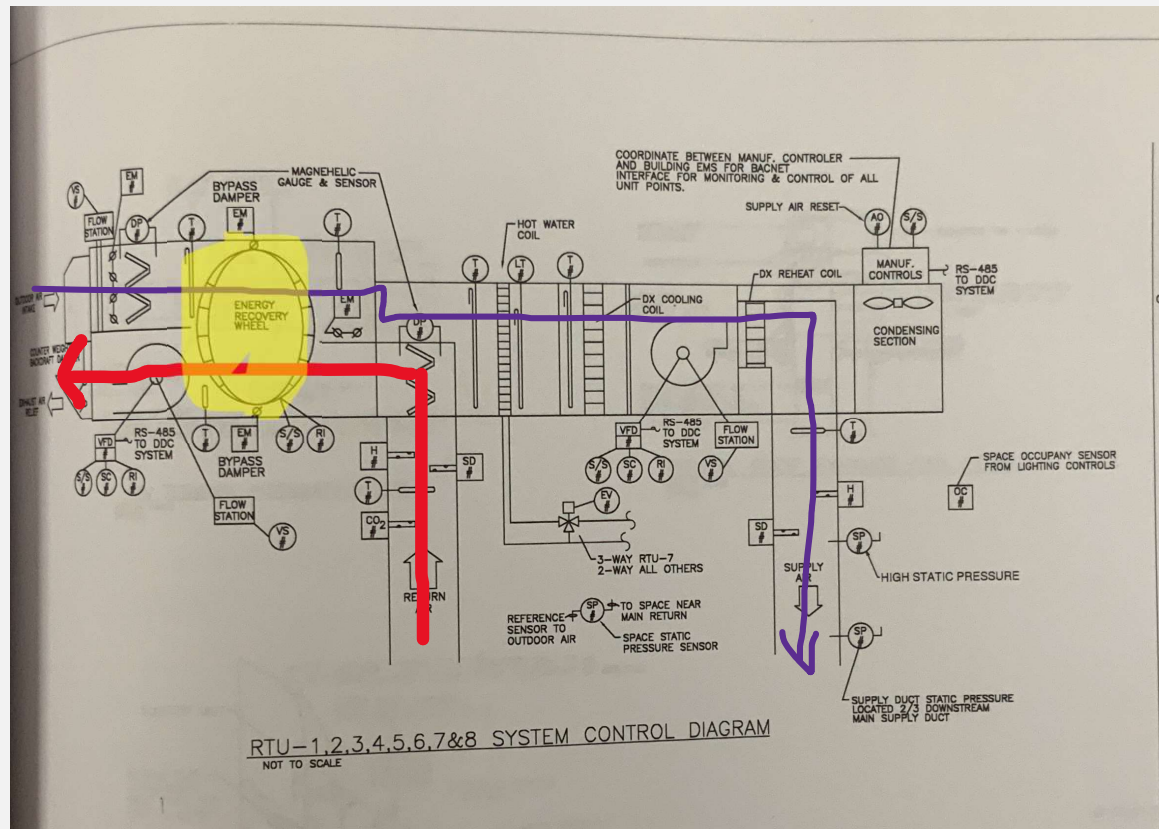
## Recirculation with mechanical ventilation



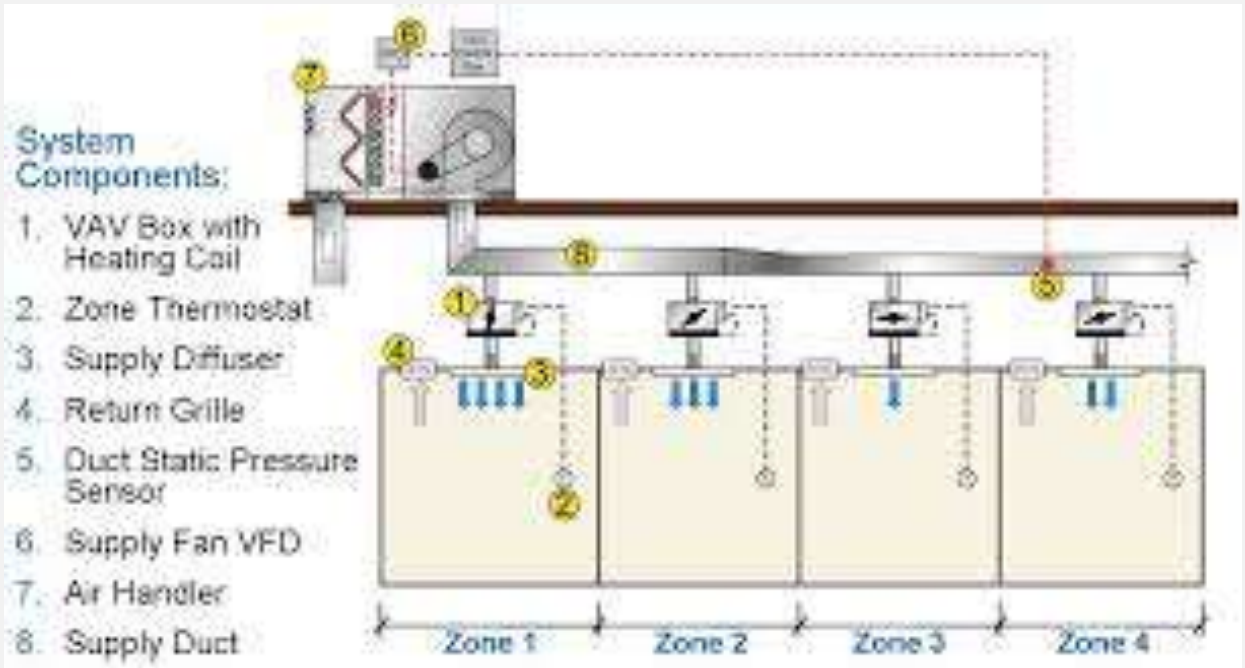
Recirculation with Heat Wheel  
- 50% outside air



## Heat Wheel with 100% outside air



## VAV systems – Offices and admin areas





## FAQ

Q. I'm concerned about COVID-19 and the air quality in my work area. How do I know my work area has adequate ventilation?

Most of our school buildings are typically supplied with a percentage of outside air either via natural ventilation or mechanical fans, dependent on each building and system. Those systems are maintained to provide ventilation and thermal comfort as designed through the following activities:

1. Air filters are in most buildings equipped with central heating, ventilation, and air conditioning (HVAC) systems are rated at MERV- 8 or higher
2. HVAC systems are set to maintain appropriate indoor temperatures as much as system designs allow, which minimizes thermal stresses on the body. Systems often do not have the capacity to increase outside air ventilation rates while still maintaining recommended indoor temperature ranges.
3. The ventilation rate per person is 40% to 50% higher under a hybrid model



## FAQ

Q. I'm concerned about COVID-19 and the air quality in my work area. How do I know my work area has adequate ventilation?

4. In most cases, exhaust fans in restrooms operate continuously when buildings are occupied. Some restrooms are equipped with a wall switch operated by the occupant, in which case it's suggested to keep toilet exhaust fans operating continuously. For restroom exhaust fans to work best, it is recommended to avoid opening operable windows in restrooms and keep restroom doors closed (or mostly closed for single restrooms not in use).
5. In naturally ventilated areas, operable windows should be open while spaces are occupied.
6. In mechanically ventilated areas, operable windows may also be opened to supplement mechanical ventilation when outside temperatures are moderate.
7. When possible, keeping conference room doors open can help promote good ventilation.

## FAQ

Q. Could you discuss best practices for windows? (fully open? Partially open? Are maximum air changes per hour achieved through fully open windows or is dependent on outside factors like temperature, outside conditions, etc.)

- If tolerable, is it best to have the windows fully open?
- When it is humid outside and/or there is not a breeze, how does that affect air changes per hour?

A. Temperature difference between outside and inside and wind speed will determine volume of air. Windows can be left fully open or partially open. Safety is important before determining that. Because exhaust fans are always running inside the building – air should always move indoors. Someone should monitor window opening and ensure that they are OPEN and CLOSED before and after school. Recommend keeping windows open 1 hour before school starts if there is no mechanical ventilation

## FAQ

Q What is being done to building HVAC given COVID-19?

Facilities is checking HVAC systems to ensure that buildings are ready for reoccupation, including but not limited to the following:

1. Fan systems are functional and operating.
2. Central HVAC fan filters are within acceptable operating ranges and replaced as necessary.
3. Changing the filters as recommended by the manufacturer
4. Outside air ventilation rates are being increased in recirculating HVAC systems where possible.
5. Adjusting control set points to provide more ventilation
6. Running the systems 2 hours after and 1 hour before any occupancy to provide for good air changes

## FAQ

Q Can I turn on a portable air-conditioning unit or fan when it gets too hot?

A. Yes, but the discharge airflow should be directed away from the body and face of other people to prevent potential transmission to nearby individuals.

## FAQ

Q. Can the building's outdoor air ventilation rate be increased?

A. Some HVAC systems are designed to mix outside ventilation air with air recirculated from occupied spaces. Many systems do not have capacity to increase outside air ventilation rates while still maintaining recommended indoor temperature ranges. However, under the hybrid model, since the number of students are lesser, the ventilation rate per person is higher than a business-as-usual scenario.

## FAQ

Q. In some of the classrooms, there are different types of AC units that are not connected to the larger HVAC system. For example, some classrooms have “ductless mini-splits” and some have portable air conditioners with vent hoses.

- Can you speak to best practice for these types of air conditioning units?
  - If able to use these units, is the best practice to still have an open window for outdoor air ventilation?
  - Do you know the MERV filtration level of the filters on these different types of units?
- A. If a room does not have mechanical ventilation – its ok to run the window AC units as long as the room is not crowded ( no more than 2 people). For example a conference room, or teachers lounge. Recommend keeping window open for natural ventilation. If the classrooms have unit ventilators, so best for it to be running to bring in outside air. If it does not have natural ventilation or mechanical ventilation, then install HEPA air purifiers
- B. Window AC and split units have very low MERV rating. Some are just metallic filters or catch dust or smoke.
- C. If there is a room with a window AC or split unit AND there is not mechanical ventilation and you are expecting more than 2 or 3 people in that room after social distancing – then HEPA air purifiers are recommended

## FAQ

### **FANS**

- Standing fans blowing over students is not recommended
- A window exhaust fan can be installed, and air blown outside
- A standing fan can be installed near a window with air blowing outside

## FAQ

- What specific criteria will be used to determine that a room, floor, or even entire building has sufficient ventilation to open safely? Will administration close a room, floor, or entire building if it does not meet that criteria?

Weekly checks of CO2 levels in classrooms ( for Peabody and Sanborn) will help determine adequate ventilation. If a classroom is stuffy or muggy and felt by the teacher, then facilities should be informed who should check if the outside air damper is operational. Other schools have automated systems that monitor CO2 and will ventilate properly. We are changing the set point to 900 ppm, that gives the assurance that we are over ventilating.



## FAQ

- What specific data will be collected during the school year to determine whether or not a building's HVAC system is operating sufficiently to ensure the safety of faculty, staff, and students? At what intervals will data be collected? Who will collect the data? Who will analyze the data? How will the data be made available to the school community?
- Monitoring the CO2 levels on a regular basis and documenting them is good evidence of proper ventilation. CO2 levels should not go over 1100 ppm. In addition random checks of outside air dampers should happen especially for older schools that do not have automatic controls.

## FAQ

- Q How to improve ventilation in stairwells
- Answer: Stairwells are never ventilated unless it is a high rise. They are not designed for people to “hang out”. As long as mask is worn and people are crossing each other with contact less than 6 feet for less than a few minutes or even seconds – it is not an issue.

## FAQ

Q. Many classrooms in some of our buildings can be extremely hot for long periods of time in September and May and June. Without the use of oscillating fans it is not possible to keep students cool (who this year will be wearing masks). Many rooms have windows that do not allow for the use of box fans. How will these rooms be cooled? This is more than just a “thermal comfort” issue. This is a student-health issue.

A – Hot and Humid days – District should make a decision on “Heat Days”. Turbulent flow across students is not recommended. If conditions inside the room are not comfortable – alternative methods should be discussed by the schools

## FAQ

Q - Effect of humidity - especially in winter

A – HVAC systems are not designed to maintain humidity in winter. ASHRAE 62.1 which applies to non-residential buildings has no lower humidity requirements at all.

- ASHRAE standard 170 requires a minimum of 20% RH for most hospital areas. Patient rooms and nursing facilities have no minimum requirements
- RHEVA – European standard - .... Evidence does not support that moderate humidity (RH 40% -60%) will be beneficial in reducing the viability of SRAS-COV-2. Small droplets under interest( 0.5 micron – 10 micron) will evaporate fast under any RH level”

THANK YOU